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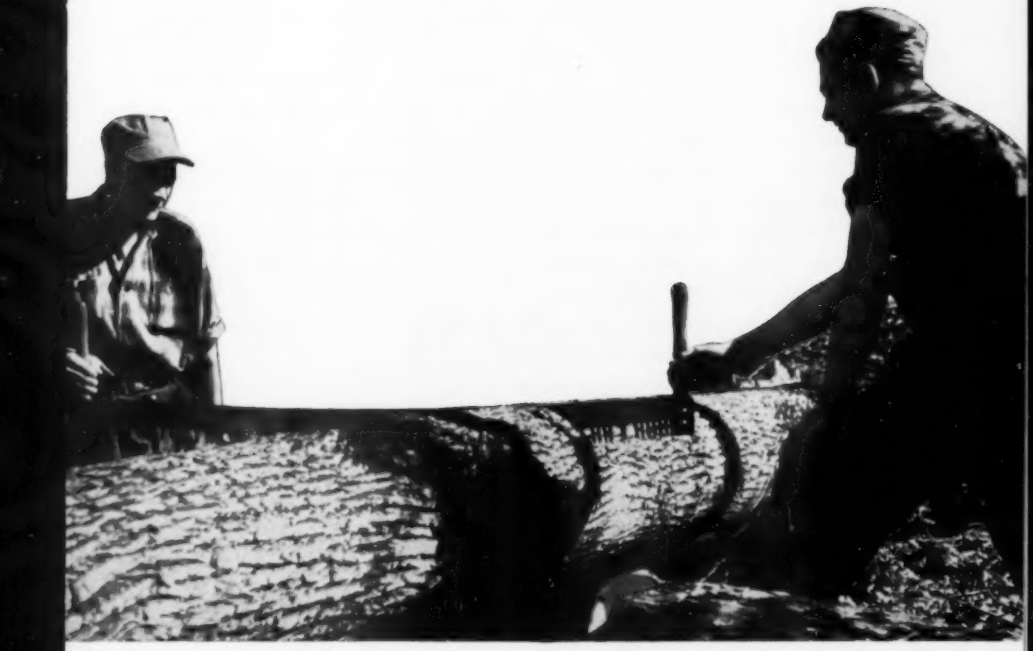
Home-Grown Lumber for Farm Buildings

By FRED E. WINCH, JR.



New York State College of Agriculture

HOME-GROWN LUMBER FOR FARM BUILDINGS

FRED E. WINCH, JR.

For farmers who need new buildings or must remodel or repair old ones, the farm woodlot offers an opportunity to obtain low-cost lumber, just as it did in pioneer days. The late fall or winter months, when other work is lighter, offer an opportunity to cut logs in the woodlot, skid them to the roadside, and send them to the mill for custom sawing.

Most New York woodlots contain a variety of species adapted to general construction purposes. The common species of the farm woodlot and the use to which they can be put in farm building construction are listed in table 1.

Whether or not buildings constructed of home-grown lumber are satisfactory depends on the following:

1. The quality of the trees cut. High-quality logs yield high-quality lumber.
2. The quality of the milling of the timber. Poor sawing results in poor lumber even from high-quality logs.
3. Care in handling the lumber after sawing. Proper piling and seasoning are essential to produce high-quality lumber.
4. Selection of the correct species for the intended use. Durable woods should be used wherever needed.
5. The use of approved building plans and practices.

SELECTING AND CUTTING THE LOGS

When you have decided to build or repair a building, first prepare or select the plans for the construction work. Once you have the plans made, you can draw up a bill of material which lists the number of board feet of lumber of each type and dimension needed.

TABLE 1. COMPARISON OF VARIOUS NATIVE SPECIES FOR CONSTRUCTION PURPOSES*

1. Woods combining use requirements in **high** degree
2. Woods combining use requirements in **good** degree
3. Woods combining use requirements in **fair** degree

Species	House											Barn and service building							Miscellaneous	
						Flooring				Interior trim										
	Framing	Sheathing	Siding	Exterior trim	Roofers	Sub	Living and bedroom	Kitchen	Porch and outside step	Natural	Painted	Plates, joists, sills, rafters	Roofers	Studding	Siding	Stall flooring	Silos and tanks	Gates	Concrete forms	Piers or posts
Aspen	.	2	.	.	3	.	.	.	.	.	.	.	3	.	3§	.	.	.	3	.
Ash	1	.	.	.	1	1	1	2	.	1	3	1	.	2	.	1	.	.	.	1
Basswood	.	1	.	.	2	.	.	.	.	.	2	3	2	.	.	.	.	.	3	.
Beech	1	.	.	.	1	2	1	1	.	2	2	1	2	2‡	.	1	.	2	3	2
Birch	1	.	.	.	1	2	1	1	.	1	1	1	2	.	.	1	.	2	3	2
Cedar, white	.	1	1	.	2	.	.	.	.	.	.	3	2	.	1	.	.	2	.	.
Cherry	.	.	.	.	2	.	2	.	.	1	1	2	2	.	.	.	.	.	.	1
Cottonwood	.	2	.	.	3	.	.	.	.	.	.	3	3	.	.	.	.	.	3	.
Elm	3‡	.	.	.	1	2	.	3	.	.	.	2	1	2‡	.	1	.	.	.	2
Hemlock	2	1	.	2	2	2	.	.	.	.	2	2	2	2	3	.	2	2	2	2
Hickory	.	.	.	.	.	.	1	1	.	.	.	.	.	.	.	1	.	.	.	.
Locust	.	.	.	.	.	.	.	.	1	.	.	1†	.	2	.	1	.	.	.	1
Maple	1	.	.	.	1	2	1	2	.	2	2	1	2	2‡	.	1	.	2	3	1
Oak																				
Red	1	2	.	.	1	2	1	2	.	1	3	1	2	2	.	1	.	2	3	2
White	1	.	.	.	1	2	1	2	1	1	3	1†	2	2	.	1	1	1	.	1
Pine, white	2	1	1	1	2	2	.	.	.	1	1	3	2	2	2	.	2	2	2	.
Spruce	2	1	2	2	2	2	2	.	.	.	2	2	2	2	3	.	.	2	1	2
Tamarack	3	2	.	.	.	.	.	.	.	.	.	2	2	3	.	2	2	.	.	2
Tulip and cucumber	2	1	2	1	2	1	.	.	.	.	1	2	2	2	2	.	.	2	.	.
Walnut	.	.	.	.	.	.	.	.	1	1	1	.	.	.	.	.	.	.	.	1

*This table was adapted from U.S.D.A. Farmers' Bulletin 1756.
†Best for sills.
‡Likely to twist and warp.
§When painted.

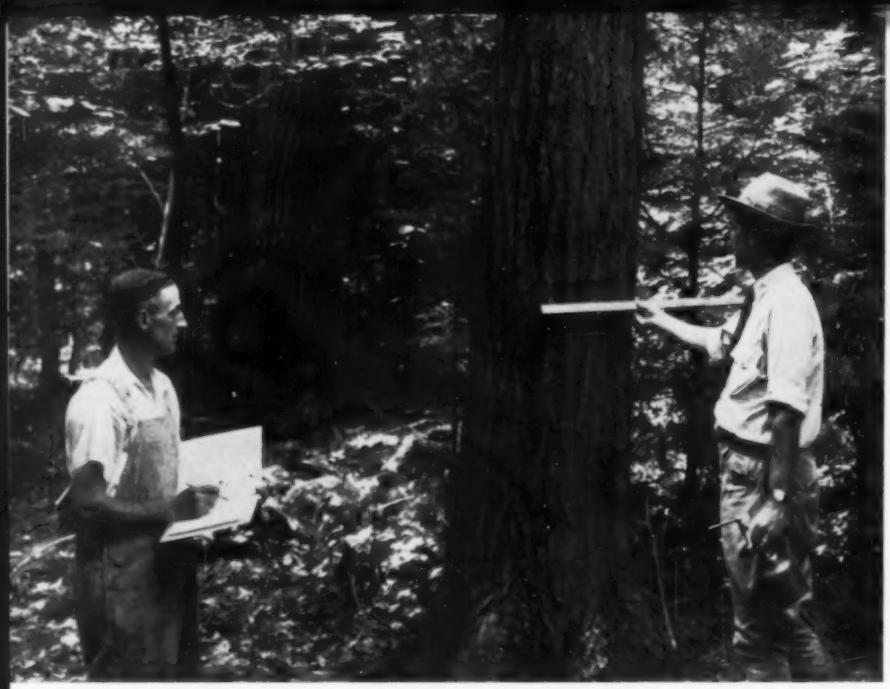


Figure 1. Estimate and mark the timber needed.

The farm woodlot is a reservoir of building material. Remembering the high current prices, you may decide to sell part of the better quality logs and use the lower grades without any deterioration in the quality of your building. Proceeds from the sale of high-quality logs may be used to purchase special grades of lumber adequate for the purposes intended.[1]

Make an estimate of the standing timber available in the woodlot.[2] Then mark for cutting the amount needed of such species as determined from the bill of materials. Add at least 20 per cent to the bill for cull and wastage. Remember that large hardwood trees (18 inches or more in diameter at the stump) generally have the highest quality lumber and cost the least, per thousand board feet, to fell, saw into logs, and manufacture into lumber.

The tools used in logging may be the time-proven axe, the crosscut saw, and wedges. Usually, if farm labor is not available, you can have this work done by others, often with power equipment. It is not practical for an individual to purchase a power-chain saw for small logging jobs because depreciation on such

[1]Further information on forest management is given in Cornell Extension Bulletin 770, *Care and Culture of Farm Woodlots*, available from the Mailing Room, New York State College of Agriculture, Ithaca, New York.

[2]To assist in making the inventory, you may obtain at a small cost a set of cruising and scaling sticks, with instructions for their use, from the Department of Forestry, University of Maine, Orono, Maine.

Figure 2. Logging may be done in the slack seasons. The cross-cut saw is still efficient for small logging jobs.

Figure 3. Power equipment may be hired for felling and bucking timber. Such jobs require a short time with equipment such as this.

equipment is high. At present, in nearly every rural community, there is a power-chain saw available for custom work. Usually the owner of the saw and a helper fell and buck the timber at an hourly rate, or at a flat rate per thousand board feet of logs cut. For a woodlot owner to obtain the greatest output from the saw at a minimum cost, he should supply at least one man to swamp out around each tree, limb up trees ahead of the saw and block up the logs to prevent the saw from pinching.

Cut log lengths to correspond as nearly as possible to lengths of material, or multiples of the length, required. Thus if 6-foot 2 x 4's are needed, cut logs 12 feet in length, plus a 3-inch trimming allowance. You may cut and saw logs at any time of year but fall and winter usually offer advantages. At that time the work interferes less with other farm work, insects and fungi cause little or no damage, skidding is easier, and the rate of seasoning is slow, with the result that the loss from checking is held to a minimum.

CUSTOM SAWING

The sawing of the lumber is one of the most important considerations. It pays to find a millman who has good equipment, kept in good condition, and with a reputation for doing a good job of custom work. Such a millman may

Figure 4. Skid the logs to a truck for easy hauling.

charge two or three dollars more a thousand for sawing, but will save you money in the long run, since a uniform product will be manufactured. The lack of accuracy in sawing results in the loss of several hundred board feet in a thousand. The use of lumber not of uniform thickness and width makes an unsightly job and, more important, results in the use of more labor and a less well-constructed building.

Common defects in sawing to be noted at the mill and to be avoided are: variation in thickness of individual boards, variation in widths and thickness of dimension, disregard of the requested bill of materials, and slipshod piling as lumber is removed from the saw.

PILING THE LUMBER

As the lumber is sawed, haul it immediately to the farm and pile it whether it is to be seasoned or used green, *because the first few weeks after sawing are the most critical.* During this period the character of the lumber can change. High-quality lumber sawed from high-quality logs can be changed to poor-quality lumber full of checks, curl, warp, and bow if it is not properly piled.

Site

Select a well-drained site that permits good circulation of air. It should be free of weeds, brush, and trash. The ground surrounding the pile should be free of chips, shavings, rotting wood, and bark which can transmit rot and stain to the freshly cut lumber.

Figure 5. High-quality logs such as these can be made into poor lumber by a poorly operated mill.

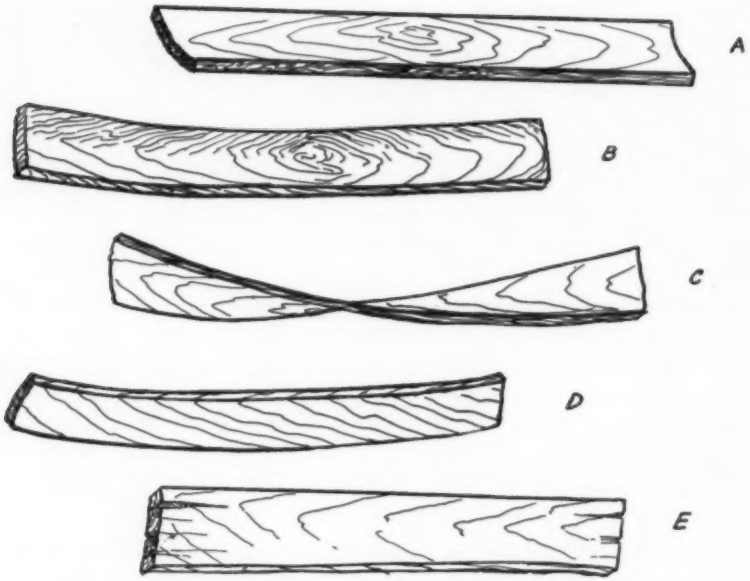


Figure 6. Common defects of lumber not properly piled: (A) cup, (B) bow, (C) twist, (D) crook, and (E) check.

A solid base

Use heavy peeled posts, from 8 to 10 inches in diameter and preferrably of a durable wood, for the base piers (concrete may be used if preferred). Set the piers 3 feet in the ground, space them 3 feet apart in the row (front to back), with rows from 4 to 6 feet apart. Piles should not be more than 8 feet wide (3 rows of piers). Since most farm material is cut 12 feet long, there will be 5 piers in each row.

Slope the foundation from front to back at the rate of 1 foot in 12. Start with the back piers (the lowest) 15 inches from the ground, making the base as long as the length of the longest number to be piled. Thus the front pier of a 12-foot pile will be 27 inches high; if 16 feet, the front pier will be 30 inches high.

Place 6x6-inch stringers on top of the piers lengthwise. On the stringers place 4x6-inch cross members over every pier and halfway between piers. Be sure to use only dry, sound material for the supports. Usually, several piles will

be needed. At least 4 feet should be left between each pile to give free circulation of air.

Stickers

Stickers are used to separate the layers of boards. All must be of the same thickness, about 1 inch, and well-seasoned. If the stickers vary in thickness, the boards will be crooked when seasoned; if they are wet, the lumber will stain.

Piling

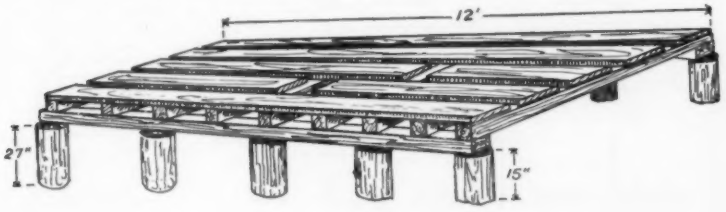
Place a single layer of lumber on the supports, with the longest boards on the outside. Leave a 2-inch space between boards. Short lengths of boards may be placed within the pile, with both front and rear ends of the pile flush. When the first layer is complete, place stickers crosswise of the pile directly over the piers. The front sticker should protrude ½ inch beyond the end of the boards to reduce end checking (figure 7).

Use stickers of the same thickness throughout. Keep the stickers lined up one directly above the other. Pile boards of the same thickness in the same layer. Build the pile so it shields itself from the rain by placing each layer forward as it is built. For each foot in height, have a forward pitch of 1 inch. Seldom should piles be more than 12 feet high.

On the last course of boards, place 4-by-6 inch crossmembers above the stickers. Build a roof of a layer or two of boards or slags on top of these, with the ends extending 2 feet beyond each end of the pile. Wire the roof on, or weight it so that it is secure from the wind. This roof will prevent rain and snow from penetrating the pile.

It is advisable to separate the lumber by species that require the same length to season. For example, beech, birch, cherry, and maple require approximately from 150 to 200 days to reach an air-dry condition. Pine and hemlock require from 60 to 150 days (table 2).

Figure 7. Build a solid base for the lumber pile with base logs extending as far below ground as above. Here the first layer of boards is in place.



To season 2 x 4's, 2 x 6's, or 2 x 8's, place them in a separate pile with the long face vertical. Use additional 2 x 4's for stickers placed with the long face horizontal. If elm, aspen, or cottonwood are to be seasoned, use double the number of stickers because they tend to twist and warp.

SEASONING

Lumber to be used in a seasoned condition should remain in the pile in accordance with the length of time each species requires to reach an air-dry condition (from 10 to 18 per cent moisture content). The approximate length of time for seasoning 1-inch boards to air-dry condition, if part of the seasoning period is during May, June, and July, is given in table 2.

Thicker lumber takes a proportionately longer time to season. The time needed, of course, depends on the weather, temperature, and moisture conditions prevailing during the seasoning period. Generally, wood seasons slowly in late fall, winter, and early spring; hence it is best to start the seasoning process during those seasons to reduce checking.

Figure 8. The completed pile protected from rain and snow with good air circulation.

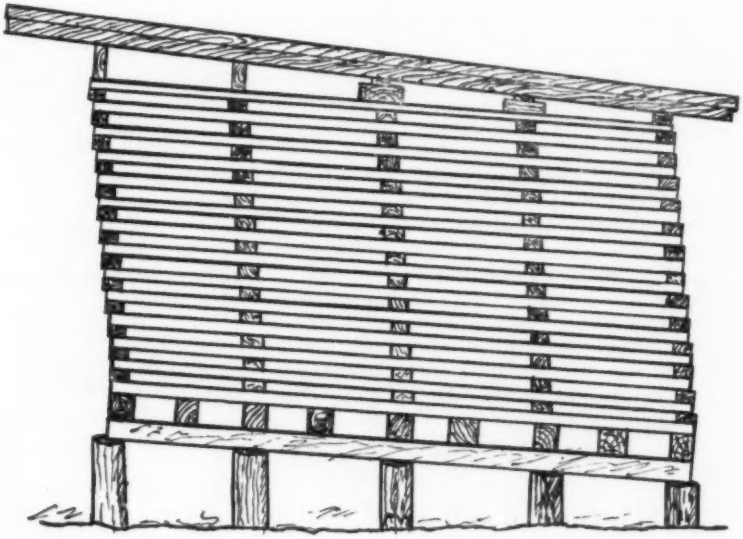


TABLE 2. AVERAGE TIME REQUIRED FOR 1-INCH LUMBER OF VARIOUS SPECIES TO REACH AIR-DRY CONDITION

Species	Number of days
Ash	70 to 110
Basswood	30 to 60
Beech	150 to 200
Birch	150 to 200
Cherry	150 to 200
Cottonwood	60 to 90
Elm	80 to 130
Hemlock	60 to 150
Hickory	150 to 200
Maple	150 to 200
Oak (red)	170 to 250
Oak (white)	240 to 300
Pine (white)	60 to 150
Spruce	45 to 90
Tulip	40 to 70
Walnut	120 to 180

No wood will air-season enough to be used as flooring, furniture, or interior trim. For such uses either air-dried or green lumber must be kiln-dried to reduce the moisture content still further (from 6 to 8 per cent moisture content).

To prevent or reduce end checking of lumber 2 inches or more in thickness coat the *freshly* cut ends with white lead paste or paraffin. If end checking has once started, there is no way to stop it.

GREEN LUMBER

While it is obvious that seasoned lumber is to be preferred for most building purposes, it may be necessary to use green lumber. Best results will be obtained from lumber that has been piled immediately after it was sawed, as suggested on pages 6 to 10.

Hundreds of barns, hog houses, chicken coops, and other service buildings have been built of native green lumber. If tightly roofed, such buildings will be serviceable for decades, even though unpainted. The use of hemlock for framing, siding, and shingles has been most prevalent, but green hardwoods have also been used.

Green lumber has some advantages for farm construction. It may be used immediately. Hardwoods, most commonly found in the farm woodlot, nail easier when green than when seasoned.

The disadvantages of green lumber are many. Green lumber shrinks about 10 per cent in thickness and width as it seasons in place; hence buildings are not tight. Green lumber contains a great deal of moisture; therefore, it is heavier to handle, and larger and stronger joists and sills are required to bear the added weight. As seasoning will be done in place, longer nails must be used to prevent

cupping and warping. Green lumber has lower nail-holding capacity than has seasoned lumber. Planing and finishing the lumber is more difficult, and at least a year should elapse before the buildings are painted. During this time there will be some checking and warping, especially in siding and sheathing exposed to the weather.

Construction

Since the lumber shrinks in width and thickness as it dries, be sure to cut full dimension all lumber used green. For example, when construction plans call for 2 x 10's (dressed and seasoned these are $1\frac{5}{8}$ x $9\frac{1}{2}$ inches), cut the pieces a full 2 inches thick and 10 inches wide. Cut boards a full 1 inch in thickness.

Sheathing and siding must be nailed close and tight, as cracks from shrinkage will develop as the wood seasons. Diagonal sheathing increases the strength of a building from three to five times that of horizontal sheathing and may be substituted for some of the studding and bracing; thus weight is reduced as well as the quantity of materials and labor required. Vertical siding outlasts horizontal siding by many years, as there are few areas to hold moisture. Battens over cracks should be from $2\frac{1}{2}$ to $3\frac{1}{2}$ inches wide. Use 10-penny instead of 8-penny nails. To make sure the board is secure use four nails where two are enough in seasoned lumber.

Painting

Green lumber does not take paint readily. If paint is applied, usually it peels off. The lumber in the buildings should, therefore, season for at least a year before painting so that the wood is air-dry. Rough boards, after seasoning, soak up more paint, especially since many of them will be season checked. Spray painting, however, covers well and does a good job in a short time. Many existing barns and service buildings have never been painted and have lasted for nearly a hundred years. A good cover of paint, periodically renewed, increases the life of the building many years.

SEASONED LUMBER

In building construction, it is always advisable to use seasoned lumber and to maintain this lumber in a dry condition. If this princple, namely, of using seasoned wood and maintaining it in proper condition, is not taken into account, structures are almost certain to develop such faults as cracking of plaster, air leaks, warping of doors, floors, and window frames, and decay. Therefore, in building with wood it is recommended that the lumber be dry at the time it is placed in use and that the construction plans are such that the wood will remain in dry condition. Shrinkage of various woodlot species is given in table 3.

How to tell seasoned lumber

If you have seasoned your lumber for the periods indicated in table 2, you may be reasonably certain that this lumber has reached air-dry condition. If, however, you must use lumber about which little of past history is known, try the following test to determine the moisture content.

First saw off two or more 1-foot long blocks of the lumber to be used. These blocks should be taken at least 1 foot from the end of the board or 2 x 4, so that the end of the board, which is the driest, will not be used. Weigh the samples immediately, and record the weight. Place the piece in a warm oven at approximately 200° to 225° F. After several hours at this temperature, weigh the samples again. Replace it in the oven for at least an hour more, remove and weigh again, and record the weight. The last two weights should be the same. Compute the moisture content in percentage by dividing the loss in weight by the oven-dry or final weight.

Another method is to dry the samples on a heated radiator and follow the same procedure of taking weights and calculating moisture percentages.

Examples:	*Example 1*	*Example 2*
Original weight	34 ounces	41 ounces
Final weight	30	34
Difference	4 ounces	7 ounces
$4 \div 30 \times 100 = 10.3$ per cent		$7 \div 34 \times 100 = 20.6$ per cent

The results indicate that the lumber in example 1 with 10.3 per cent moisture content is considered air-dry; the lumber in example 2 with 20.6 per cent moisture is not thoroughly air-dried, and should be seasoned further.

TABLE 3. FARM WOODLOT SPECIES LISTED ACCORDING TO AMOUNT OF SHRINKAGE

A Small amount of shrinkage	B Medium amount of shrinkage	C Great amount of shrinkage
White cedar	Ash	Aspen
White pine	Cherry	Basswood
	Fir	Beech
	Hemlock	Birch
	Soft maple	Cottonwood
	Yellow poplar	Elm
	Spruce	Hickory
	Walnut	Hard maple
		Red oak
		White oak

The calculations described can be expressed by a simple formula namely:

$$\text{Moisture per cent} = \frac{\text{Original weight} - \text{dry weight}}{\text{Dry weight}} \times 100$$

Nailing seasoned lumber

Much of the lumber from farm woodlands is from dense species, such as ash, birch, beech, elm, oak, maple, and hickory. These species nail satisfactorily while green but when seasoned present some difficulty.

Probably the easiest solution to the problem of nailing dense hardwood is to bore holes in boards or dimension stock with an electric or high-speed geared hand drill. Several holes a minute may be bored with an electric drill; nailing time is reduced and splitting is prevented. If the nails are to be driven without drilling holes, use a very heavy hammer.

Seasoned hardwood lumber splits easily. Use nails of smaller gauge (diameter); high nail-holding power of dry, dense hardwoods compensates for the smaller diameter of the nails used. Blunt-pointed nails set as far as possible from the end of the board cause less splitting. To blunt a handful of common nails at one time, hold them on a emery stone. Then coat the end with oil, soap, or beeswax, to reduce both the splitting and the force needed to drive them.

Warping is the cause for much of the difficulty in nailing hardwoods, since a great deal of the force of the blow in nailing a warped board is for the most part absorbed by the "spring" of the board. If the lumber has been piled correctly, there will be little or no warp. A small wedge or shim placed behind the warped part of the board until the nails are well started prevents much spring.

PROTECTION OF LUMBER IN SERVICE

Lumber absorbs moisture, not only from the air, but also by direct contact with rain, snow, or surface water. In addition, wood takes on moisture when in direct contact with moist concrete, bricks, or other building material. Moisture absorbed from condensation is also to be considered. Protection of woodwork from moisture, therefore, requires not only that contact with soil and water be prevented, but that adequate air drainage and circulation be maintained where air is likely to be damp. Situations where such conditions are likely to occur are under steps, porches, and over unexcavated areas.

Preservatives

Lumber to be used where moisture will be a problem must be treated to prevent decay. Several commercial preparations are on the market. Those most commonly available are solutions of pentachlorphenol and copper-napthenate. These chemicals are best applied to seasoned lumber by a spray gun or by paint

brush. Both are applied in solutions of volatile carriers which penetrate the wood. Where lumber is in constant contact with moisture, as in a barn sill, for example, a preliminary "cold soak" treatment rather than surface treatment is recommended. If possible, make all cuts and borings previous to treatment. When this is not possible, flood or brush the cut areas with the preservative before use. This chemical treatment does not prevent later painting.[8]

Painting

On surfaces where the lumber is exposed to the weather or condensation, periodically renew the surface with paint, oil stain, or varnish to prevent moisture from penetrating the wood and to reduce the abrasive action of the wind and the elements. The lumber will last many years longer. Tightly caulk or putty the joints of exposed siding, finish, and all exterior construction before painting so moisture cannot enter. Good construction methods and practices insure longer life of farm buildings.

ROUND WOOD

Many places in farm-building construction require the use of piers or posts to support floors or roofs. Round timbers from the farm woodlot will adequately serve for these purposes if you give them a preservative treatment to assure permanency. Round poles may also be used for rafters, studs, or stringers in small buildings. Wood thus used should be peeled to prevent damage from bark beetles and grubs. Peeling will also reduce the moisture-holding capacity of the pole and thus reduce damage from decay. Round timbers cut between May 1 and July 1, may be peeled with little difficulty; during the rest of the year you need an axe, adze, drawshave, or spud. For the most part these round timbers may be used green.

Generally, farm-woodlot species have strength enough and when used in dry locations are durable enough for use as piers or posts in construction. One of the tests for judging the minimum size of a weight-bearing pier or post is that its length should not exceed eleven times its minimum diameter; thus an 8-foot pier (96) inches should have a minimum diameter of 9 inches.

The following species are recommended for use as posts or piers:

Very strong	*Medium strong*	
Ash	Beech	Spruce
Cherry (black)	Birch	Tamarack
Locust (black)	Elm	
Maple (hard)	Hemlock	
Oak (white)	Oak (red)	

[8]Further details on wood preservation may be had from the Extension Forester, New York State College of Agriculture, Ithaca, New York.

Of these, black locust is highly resistant to decay; while white oak and tamarack are moderately resistant. Other species to be used in damp situations should be peeled, seasoned, and given a "cold-soak" treatment with preservatives as outlined on page 15.

Never use hickory in a round form, because the powder-post beetle attacks and greatly weakens it.

TABLE 4. A COMPARISON OF WOODS GROWN IN NEW YORK STATE WITH WOODS COMMONLY IMPORTED AND THE COMMON USE OF EACH

Species	Hardness	Strength	Nail-holding capacity	General use in farm buildings
I. *Native:* Ash, beech, birch, hickory, locust, hard maple, red, white, black, chestnut oaks	Hard	Strong	High	Framing, rafters floors, and finish, roofers
Imported: Southern and western yellow pine	Hard	Strong	Medium	Same as for native
II. *Native:* Black cherry, elm, soft maple, red pine, hemlock, tamarack	Medium to Hard	Medium	Medium to high	Framing, rafters sheathing, and roofers
Imported: Douglas fir, redwood	Medium	Medium to strong	Medium	Same as for native
III. *Native:* Aspen, basswood, butternut, cedar, cottonwood, cucumber, spruce, white pine, willow, yellow poplar	Soft	Weak to medium	Low to high	Sheathing, siding, roofers, and studs

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